UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/965,871	09/28/2001	Phillip M. Jones	COMP:0240 P01-3649	4019

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Intellectual Property Administration
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EXAMINER
THAI, XUAN MARIAN

ART UNIT	PAPER NUMBER
2111	

DATE MAILED: 03/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 September 2001*.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

　　4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *1-7* is/are allowed.

6)☒ Claim(s) *8-12 and 15-21* is/are rejected.

7)☒ Claim(s) *13-14* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 September 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

　　Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

　　Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

　　a)☐ All   b)☐ Some * c)☐ None of:

　　　　1.☐ Certified copies of the priority documents have been received.

　　　　2.☐ Certified copies of the priority documents have been received in Application No. _____.

　　　　3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
　　　　　　application from the International Bureau (PCT Rule 17.2(a)).

　　* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
　　Paper No(s)/Mail Date *3*.

4) ☐ Interview Summary (PTO-413)
　　Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____ .

DETAILED ACTION

Specification

1.   The information on the cross-reference to related application for incorporation by

reference on page 2 should be updated at this time.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the
> subject matter which the applicant regards as his invention.

3.   Claims 9-10 and 20-21 are rejected under 35 U.S.C. 112, second paragraph, as being

indefinite for failing to particularly point out and distinctly claim the subject matter which

applicant regards as the invention.

4.   Claim 9 recites the limitation "the posting queue" in line 3. There is insufficient

antecedent basis for this limitation in the claim. Claim 10 is rejected because it depends from

claim 9 and thus inherits the deficiencies of claim 9.

5.   Regarding claims 20 and 21, it is unclear whether the recited limitation "a first address"

is the same as or different from "a first address" recited in claim 16? Clarification is required.

Note: for purposes of consideration on the merits below, it is interpreted to be the same as "a first

address" being recited in claim 16.

Claim Rejections - 35 USC § 102

6.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 8 and 11 are rejected under 35 U.S.C. 102(e) as being anticipated by Maguire et al. (USPN 6,321,307; Maguire).

As per claim 8, Maguire discloses a method of predicting a future snoop transaction (speculative snooping) comprising the acts of: (a) initiating a snoop request having a corresponding first address from a coherency control module (bridge) to a processor controller (col. 3, lines 30-31 and 53-55; col. 7, lines 45-58;col. 8, lines 40-58); (b) returning a snoop result corresponding to the first address from the processor controller to the coherency control module (col. 8, lines 59-62); and (c) returning a next snoop forecast signal having a second address (col. 8, lines 63-67) and corresponding to the next snoop request to processed from the processor controller to the coherency control module (col. 9, lines 6-10).

As per claim 11, Maguire discloses the method of predicting a future snoop transaction, as set forth in claim 8, wherein acts (b) and (c) occur simultaneously (in addition; col. 9, lines 9-13).

8. Claims 8 and 11 are rejected under 35 U.S.C. 102(e) as being anticipated by Hayek et al. (USPN 6,115,796; Hayek).

As per claim 8, Hayek discloses a method of predicting a future snoop transaction (snoop ahead) comprising the acts of: (a) initiating a snoop request having a corresponding first address from a coherency control module (bridge) to a processor controller (col. 3, lines 36-43); (b) returning a snoop result corresponding to the first address from the processor controller to the coherency control module (col. 3, lines 36-43); and (c) returning a next snoop forecast signal having a second address and corresponding to the next snoop request to processed from the processor controller to the coherency control module (col. 4, lines 27-59).

As per claim 11, Hayek discloses the method of predicting a future snoop transaction, as set forth in claim 8, wherein acts (b) and (c) occur simultaneously (during, col. 4, lines 48-59).

9.   Claims 16-21 are rejected under 35 U.S.C. 102(b) as being anticipated by Ghosh et al. (USPN 5,813,036; Ghosh).

As per claim 16, Ghosh discloses the claimed invention including a coherency control module (system controller) configured to snoop a bus for a first address while simultaneously searching a posting queue for a second address (predictive snooping; col. 14, lines 36-55; col. 16, lines 15-51).

As per claim 17, Ghosh discloses a first request module (system controller) configured to receive requests from a first processor controller (col. 14, lines 50-52).

As per claim 18, Ghosh discloses a second request module (system controller) configured to issue snoops to a second processor controller (col. 14, lines 56-58).

As per claim 19, Ghosh discloses posting queue (buffer) resides in the second processor

controller (system controller; col. 16, lines 49-50).

As per claim 20, Ghosh discloses the coherency control module is configured to snoop a

processor bus for a first address (col. 13, lines 15-17).

As per claim 21, Ghosh discloses coherency control module is configured to snoop an

input/output (I/O) bus for a first address (col. 4, lines 30-37).

10.   Claims 12 and 15-21 are rejected under 35 U.S.C. 102(b) as being anticipated by

Merchant (USPN 5,893,151).

As per claims 12 and 15-21, Merchant discloses a coherency control module (e.g. EBL

406) configured to snoop a bus for a first address (e.g. col. 3, lines 66 et seq. bridging col. 4,

line1) and various queues (bus queue, snoop queue) for maintaining strict ordering (prioritized)

(col. 7, lines 22-32); multi-processor and multi-bus system (fig. 1) and while simultaneously

(concurrent operations) searching a posting queue (snoop queue) for a second address (col. 11,

lines 60 et seq.; col. 12, lines 21-38).

Claim Rejections - 35 USC § 103

11.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

12.   Claims 12 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deshpande et al. (USPN 6,591,348; Deshpande) in view of Ghosh et al. (USPN 5,813,036; Ghosh).

As per claim 12, Deshpande disclose the claimed invention including a method of maintaining cache coherency in a multi-processor-bus computer system (e.g. fig. 1) comprising the acts of: (a) reading a snoop transaction queue comprising at least a first snoop request having a first address and a second snoop request having a second address (FIFOs and selectively sent to the master devices; col. 13, lines 5-10), the second snoop request being prioritized subsequent to the first snoop request in the snoop transaction queue (since FIFO queues are used, request are in prioritized sequence, first in first out). Deshpande does not explicitly disclose "processing the first snoop request while simultaneously searching a posting queue for the second address corresponding to the second snoop request" (predictive snooping).

Ghosh teaches predictive snooping of cache memory for master-initiated accesses (col. 14, lines 36-55; col. 16, lines 15-51). It would have been obvious to one of the ordinary skill in

the art to modify the Deshpande system to include predictive snooping as taught by Ghosh to derive at the claimed invention. Ghosh teaches that the predictive snooping would enable the system to transfer data across bus boundary with minimal delays (see col. 6, lines 1-28).

As per claim 15, the combination of Deshpande and Ghosh teaches the claimed invention wherein the combination further teaches cache coherency system comprising:(a) searching the snoop queue in a processor controller (FIFOs; Deshpande - col. 13, lines 5-10); and (b) returning a next snoop forecast signal from the processor controller to a coherency control module, the next snoop forecast signal having a second address and corresponding to the second snoop request (predictive snooping, cache line address; Ghosh - col. 14, lines 50-55).

Allowable Subject Matter

13.   Claims 1-7 are allowed.

14.   Claims 13 and 14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

15.   Claims 9 and 10 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: In claim 1, applicants claim a method of maintaining cache coherency in a multi-processor-bus computer system comprising: "snooping a second bus for the first address" and "searching a posting queue for a posted writeback, the posted writeback having the corresponding second

address, wherein the act of searching occurs simultaneously with respect to the act of snooping" [claim 1]. Further, applicants claim "detecting a posted writeback having the corresponding second address in the posting queue; (b) re-ordering the posting queue such that the posted writeback to the second address is moved up in the posting queue; and (c) initiating a second read to a second portion of memory corresponding to the second address" [claims 9 and 13]. Prior art of record do not teach the specifics cited supra. Therefore, the claims 1-7, 9-10, and 13-14 are allowed for the reasons stated above.

Conclusion

16.   The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Bachand et al. (US20030115424) discloses cache coherency apparatus and method with transaction queues and snoop queue. Khare et al. (6,615,319) disclose mechanism for resolving cache coherence conflicts in a multiprocessor system. Khare et al. (US20020087811) disclose method and apparatus for reducing memory latency in a cache coherent multi-processor system. Koenen (6,304,945) discloses method and apparatus for maintaining cache coherency in a computer system having multiple processor buses. Donley et al. (USPN 5,822,611) teach a multiprocessor cache coherent system employing dual cache tag RAMs. Donley et al. further teach a method involves "posting" the "cycles" while storing information for completing a cycle in a queue. Thereafter, a processor is issued an immediate termination cycle so that the processor can continue with other cycles in parallel with "posted write".

17.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to XUAN M. THAI whose telephone number is 703-308-2064. The

examiner can normally be reached on Monday to Friday from 8:30 A.M. to 5:00 P.M..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Mark Rinehart can be reached on 703-305-4815. The fax phone number for the

organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

XUAN M. THAI
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XMT